Examiner: **BAREFOOT, Galen L.** Attorney Docket No. **003/1US-CIP (5500034)**
Art Group: **3644**
Applicant: **STALEY, Douglas A. et al.**
Serial No.: **09/905,179**
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For: **SYSTEM AND METHOD FOR SPACECRAFT ATTITUDE CONTROL**

BOX NON-FEE AMENDMENT
COMMISSIONER OF PATENTS
Washington, D.C., 20231

Dear Sir:

This is in response to the Official Action mailed 16 January 2003.

The allowance of Claims 1 through 13 and 22 through 24 is noted with gratitude.

Claim 21 has been rejected as anticipated by Bender et al. Reconsideration is respectfully requested. Claim 21 reads as follows:

"21. A momentum management system for attitude control of a spacecraft, the system having:

a rotor drive having an output rotatable about a drive axis at a variable drive output speed;

a gimbal assembly connected to the drive output;

a momentum wheel rotor rotatable about a rotor axis for storing angular momentum, the rotor being mounted on the gimbal to be rotated about the drive axis by the rotor drive and for tilting movement about transverse axes orthogonal to the drive axis;

a torque generation device for tilting the rotor about the transverse axes;

a sensor for measuring the speed of the rotor rotation about the rotor axis and generating a sensor output representative of said speed; and

drive control means responsive to the sensor output for varying the drive output speed so as to maintain the speed of the rotor rotation substantially constant."

Thus, according to this claim, the sensor measures the speed of the high inertia rotor about the rotor axis. The rotor speed is controlled using that sensed speed. This is different than other systems that sense the motor speed and use the sensed motor speed in the

control loop to maintain a particular angular velocity. The present system uses a rotating gimbal assembly. With the gimbal assembly, if the wheel were to be driven at a constant motor speed as in the prior art, this would result in rotor oscillations at twice the spin rate causing large loads on the gimbal flexors. The claimed system for controlling the speed to keep the rotor speed constant results in the motor speed oscillating instead of the rotor speed. Since the moment of inertia of the motor coupled with the bearing is very small in comparison to that of the rotor, the resulting oscillation has a negligible effect on gimbal loading and does not significantly affect rate sensing measurements. With reference to Bender et al., this patent describes a momentum wheel platform and steering mechanism based on a triangular shaped momentum wheel platform that is adjustable in tilt angle using jack screws located at the three corners of the platform. Bender et al. does not include a gimbal assembly, an essential element of Claim 21, it does not apparently measure the speed of rotor rotation about the rotor axis as opposed to the drive axis of the rotor drive. It discloses no control means for varying the drive output speed so as to maintain the speed of rotor rotation about the rotor axis substantially constant.

It is therefore believed evident that Claim 21 is not anticipated by Bender et al. It is further submitted that Bender et al. is not even remotely suggestive of the system defined in Claim 21. Withdrawal of this rejection and allowance of Claim 21 are respectfully requested.

Respectfully submitted,

DOUGLAS A. STALEY ET AL.

Per: _____

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CERTIFICATION OF FACSIMILE TRANSMISSION

I hereby certify that this paper is being facsimile transmitted to the Patent And Trademark Office on the date shown below.

LINDA R. HICKLING

L. R. Hickling

DATE: March 24, 2003